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INFLUENCE OF SYSTEM TECHNOLOGY ON PERFORMANCE OF SEWER SYSTEM IN URBAN AREAS IN KENYA

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Abstract

The Kenyan water sector underwent far-reaching reforms through the Water Act No. 8 of 2002. The Ministry of Water and Irrigation is in charge of policies for water supply and the Ministry of Public Health and Sanitation is in charge of policies. Despite all the government efforts to modernize urban sewer system, there has seen complains that the urban sewer systems are not up to standards. This has been characterized by poor drainage of sewer system, blockage of pipe, spilling and flooding of wastes in towns. The study objective was to establish how System technology influences performance of sewer system in urban areas. The research question was how does system technology influences performance of sewer system in urban areas. The study adopted descriptive research design. Data was analyzed in relation to the study objective. The data was presented and classified in form of tables. The study noted that there are no ICT systems to monitor sewer operations. Majority of the respondents indicated that the member of staff in IWASCO does not have appropriate technology to manage the system. With the poor sewer performance by IWASCO in Isiolo town, Kenya there have been notable reforms in the sewer management has been introduced and that has resulted to improvement in the sewer management. The study recommended that the management should keep up the good spirit of embracing modern technology that will enhance sewer performance and that the management of IWASCO should endeavor to maximize their staff capacity by training them and equipping them with technology skills for effective management of sewer performance.

Keywords: Public administration, Influence, System Technology, Performance, Sewer System

INTRODUCTION

In Africa, millions of its population without water supply and access to sanitation is even worse than water supply. This situation is the cause of water related diseases, loss of valuable productive time and greatly contributes to perpetuate poverty on the continent. In line with its strategic plan for 2003 to 2007 and in response to the Africa Water Vision and the UN Millennium Development Goals on water supply and sanitation (WSS), the African Development Bank Group launched an Urban Water Supply and Sanitation Initiative (UWSSI) with the view to accelerating access to water supply and sanitation services in Urban Africa. Access to water supply and sanitation has been determined to contribute to poverty reduction and spur economic development (Akinola, 2002).

The Rwanda Water & Sewerage Sanitation is part of the Bank Group's contribution towards meeting the international development goals on water supply and sanitation, while addressing a major developmental. The water supply and sanitation infrastructure is insufficient, especially in rural areas and concerning sanitation. There are substantial discrepancies between access data from various sources, partially because of different definitions being used by different institutions that are providing access data (Buller, 2006). The share of non-functional sewer supply systems in Ghana is estimated at almost one third, with many others operating substantially below designed capacity. However, according to the multi-donor Africa, assessment access to an improved water sources is much lower (56%) and access to improved sanitation is higher (35%). Moreover, domestic water supply competes with a rising demand for water by the expanding industry and agriculture sectors.

Ghana aims at achieving 85% coverage for water supply and sanitation by 2015, which would exceed the Millennium Development Goals' target of 78%. According to one estimate, only one quarter of the residents in Accra receive a continuous water supply, whereas approximately 30% are provided for 12 hours each day, five days a week. Another 35% are supplied for two days each week. The remaining 10% who mainly live on the outskirts of the capital are completely without access to piped water and sewer services. The lack of clean drinking water and sanitation systems is a severe public health concern in Ghana, contributing to 70% of diseases in the country. Consequently, households without access to clean water are forced to use less reliable and hygienic sources, and often pay more (Buller, 2006).

Statement of the problem

The Kenyan water sector underwent far-reaching reforms through the Water Act No. 8 of 2002. The Ministry of Water and Irrigation is in charge of policies for water supply and the Ministry of Public Health and Sanitation is in charge of policies. Water and sanitation sector in Kenya is

characterized by institutional fragmentation that led to numerous inefficiencies and by subsequent attempts at reform. 95% of the excreta disposal facilities in Kenya urban areas are major use of sewer systems hence providing varied degrees of safety, hygiene and privacy.

The government of Kenya has provided legal framework and entered into collaboration with donors such as JICA to ensure that the sewer systems in Kenya urban areas are functioning properly and sanitation is improved.

Despite all the government efforts to modernize urban sewer system, there has seen complains that the urban sewer systems are not up to standards. This has been characterized by poor drainage of sewer system, blockage of pipe, spilling and flooding of wastes in towns. This can be exemplified by low delivery of services, lethargy, cronyism, slow implementation of government policies and programs leading to hue and cry from the stakeholders both internal and external.

It is in this strength that the researchers have identified that there exists a problem which requires a study to establish the factors influencing sewer systems in urban areas.

Objective of the study

To establish how System technology influences performance of sewer system in urban areas.

Research question

How does system technology influences performance of sewer system in urban areas?

Delimitation of the study

The study population included all sewer consumers of Isiolo water and Sewerage Company which includes commercial and domestic consumers. There is a total of 563 sewer consumers in Isiolo town, Kenya. This is because for the researcher to come up with precise findings, recommendations and conclusion, all clients must be involved. The researcher would use the data gathered from the sewer consumers to generalize the finding.

LITERATURE REVIEW

System technology (ICT) and performance of sewer

Automation and ICT were adopted in sewer supply facilities and networks since the early fifties. Most of modern sewer supply plants in the developed countries are nowadays fully automated, utilizing ICT for synchronization of water supply with demand, regulation of pumps operation for energy savings, coordination of withdrawal from different sources and reservoirs and control of purification processes in sewerage reclamation facilities (Davis, Bagozzi & Warshaw, 2001).

The introduction of variable speed pumps, incorporating frequency adjustment drives, facilitates high-level regulation of discharge and pressure regime for savings of energy and water. The use of this advanced technology was boosted by the increase in oil price during the last decade. The anticipated oil price hike in the future increases the incentive for more extensive adoption of ICT in water supply facilities. Energy savings by installed appliances, amount to 20% - 30% by increasing the efficiency of pumping units, balancing withdrawals and eliminating pressure surges and fluctuations (Tjandraatmadja & Burn, 2005).

The public sector, particularly government facilities, sewer supply is lagging behind the in controlling the supply and consumption. Most government facilities consumers in the world do not pay for sewer according to consumption. Many of them do not pay at all for the sewer consumed (Renzetti & Dupont. 2004). Only in limited number of countries, like Israel, each consumer's sewer outlet is equipped with a sewer meter. But, due to increasing worldwide sewer facilities shortages, interest is growing in measuring government and household sewer consumption and invoicing the users according to the actual amount of sewer consumed.

The planning and design of wastewater management systems in European and American cities was usually based on the experience of the design engineers because the transfer of technology was slow, and standardized wastewater management procedures were not yet widely published. During the nineteenth century, junior engineers from most disciplines would learn engineering skills on the job from senior engineers. The newness of wastewater management meant that there were few experienced engineers available in the United States.

Consequently, the first coordinated U.S. wastewater management efforts followed practices established in Europe. European cities were constructing large-scale centralized water-carriage sewer systems and proving them successful for removing wastewater from urban areas. U.S. engineers often consulted with the designers of the successful European systems when designing their own systems. Thus, through person-to-person technology transfer, European engineers promoted the use of centralized sewerage technology in the United States.

THEORETICAL REVIEW

Technology Acceptance Model

One of the well-known models related to technology acceptance and use is the technology acceptance model (TAM), originally proposed by Davis in 1986. TAM provides a basis with which one traces how external variables influence belief, attitude, and intention to use. Two cognitive beliefs are posited by TAM: perceived usefulness and perceived ease of use. According to TAM, one’s actual use of a technology system is influenced directly or indirectly by the user’s behavioral intentions, attitude, perceived usefulness of the system, and perceived

ease of the system. The study adopted this model to explain the role of information in enhancing efficiency in the provision of sewer services.

RESEARCH METHODOLOGY

The study adopted descriptive research design employing ex- post facto technique. According to Kothari (2009), this design will help the researcher to report what has already happened in the ground or what is happening since the problem has been well designed.

The study population included all the 15 management employees of Isiolo water and Sewerage Company and the sewer consumers in Isiolo town, Kenya. The sewer consumer population included the commercial and domestic consumers. There are 578 sewer consumers who comprise of both commercial and domestic. The study used stratified sampling method, where each institution was treated as a stratum. Since the population is not large for the IWASCO management and commercial consumers, and there are well organized structures where the respondents can be found easily, the researcher conducted a census. For the domestic consumers who are landlords, the researcher used a simple random method where 10% of all the respondents was selected. A list of all the domestic consumers was drawn from the sewer service provider. The researcher assigned numbers and every 10^{th} consumer was picked as a respondents hence a total of 50 respondents from domestic consumers was used. A total sample of 128 respondents was used for the study.

The questionnaire was used to collect the data from the sample. Data analysis process included data sorting, editing, coding, or variable generation, data entry, cleaning, processing and interpretation of results. The SPSS tool was used by the researcher to analyze data. Descriptive statistic such as mean, median and mode was used. Quantitative data was represented using tables while qualitative data was presented in narrative form.

ANALYSIS AND RESULTS

Data was analyzed in relation to the study objective. The data was presented and classified in form of tables. Only 108 questionnaires were returned which accounted for 84% return rate. The reasons for this response rate was attributed to the fact that some of the respondents who were issued with the instruments returned questionnaires whose most items were not filled, some the questionnaires contained data which was deemed not useful or irrelevant and some of the subjects did not return the questionnaires at all.

Table 1: Lack of modern sewer system equipments

Response	Frequency	Per cent
Strongly Agree	17	15.3
Agree	54	50.3
Neutral	21	19.2
Disagree	8	7.6
Strongly Disagree	8	7.6
Total	**108**	**100.0**

The respondents were required to state their level of agreement on whether there is lack of modern sewer system equipment's. Data collected from the respondents indicated that majority (50.3%) of the respondents agreed that there is lack of modern sewer equipment's, 15.3% strongly agreed while 7.6% disagreed and another 7.6% of the total targeted population strongly disagreed that there is lack of modern sewer system equipment's. However, 19.1% neither agreed nor disagreed at all. The table and bar graph below presents respondents responses to the item.

Table 2: Untrained staff on how to operate the sewer systems

Response	Frequency	Per cent
Strongly Agree	2	2
Agree	4	4
Neutral	11	10
Disagree	25	23
Strongly Disagree	66	61
Total	**108**	**100.0**

Data collected indicated that majority of the respondents (61%) strongly disagreed that there is untrained staff on how to operate the sewer systems while 23% of the respondents disagreed that there is untrained staff on how to operate the sewer systems while 10% did not agree or disagreed that there is untrained staff on how to operate the sewer systems. However, 4% agreed and 4% strongly agreed that that there is untrained staff on how to operate the sewer systems.

Table 3: There is sufficient competent staff

Response	Frequency	Per cent
Strongly Agree	13	12.1
Agree	28	25.5
Neutral	6	5.1
Disagree	11	10.2
Strongly Disagree	51	47.1
Total	**108**	**100.0**

Majority of the respondents 47.1% strongly disagreed that there is sufficient competent staff, 25.5% of the respondents agreed that there is sufficient competent staff while 12.1% of the respondents strongly agreed that there is sufficient competent staff and 10.2% disagreed. However 5.1% did not agree nor disagree sufficient competent staff.

Table 4: There is ICT systems to monitor sewer operations

Response	Frequency	Per cent
Strongly Agree	7	6.4
Agree	23	21.7
Neutral	14	12.7
Disagree	20	18.5
Strongly Disagree	44	40.8
Total	**108**	**100.0**

Majority of the respondents 40.8% strongly disagreed that there is ICT systems to monitor sewer operations, 21.7% of the respondents agreed that There is ICT systems to monitor sewer operations while 18.5% disagreed that There is ICT systems to monitor sewer operations and 6.4% agreed. However 12.7% were neither agreed nor disagreed that there is ICT systems to monitor sewer operations.

Table 5: Staff have appropriate technology to manage the system

Response	Frequency	Per cent
Yes	27	25
No	73	75
Total	**108**	**100.0**

Majority of the respondents 75% indicated that the members of staff in IWASCO does not have appropriate technology to manage the system while 25% of the respondents argued that the staff of IWASCO have appropriate technology to manage the system. This has led to poor management of the sewer system in Isiolo town.

Table 6: Adequate Infrastructure funding

Response	Frequency	Percent
Strongly Agree	8	7.6
Agree	26	24.2
Neutral	22	21.0
Disagree	20	18.5
Strongly Disagree	31	28.7
Total	**108**	**100.0**

Majority of the respondents 28.7% strongly disagreed that there is adequate infrastructure funding, 24.2 % agreed that there is adequate infrastructure funding, 18.5% disagreed and 7.6% strongly agreed that there is adequate infrastructure funding. However 21% of the respondent neither agreed nor disagreed with the adequate Infrastructure funding.

SUMMARY AND DISCUSSIONS

Data collected from the respondents indicated that majority of the respondents agreed that there is lack of modern sewer equipment's. Data collected from the respondents indicated that majority of the respondents agreed that there is lack of modern sewer. Respondents strongly disagreed that IWASCO staff are untrained on how to operate the sewer systems. It was also found from the data that there are sewer system technology investments and it is not poorly done. However, it was noted that there is no sufficient and competent staff. The study noted that there are no ICT systems to monitor sewer operations. Majority of the respondents indicated that the member of staff in IWASCO does not have appropriate technology to manage the

system. This was highlighted as to what has led poor management of the sewer system in Isiolo town. Majority of the respondents strongly disagreed that there is adequate infrastructure funding. Majority of the respondents strongly agreed that there is availability of sewer treatment facilities. Data obtained revealed that majority of the respondents agreed that there is availability of electricity in Isiolo town. Respondents argued that infrastructural facilities in managing the performance of sewer systems is very important.

CONCLUSION AND RECOMMENDATIONS

From the literature review it was established that the performance of sewer systems in the urban areas both globally and locally throughout the history has experienced challenges. With the poor sewer performance by IWASCO in Isiolo town there have been notable reforms in the sewer management has been introduced and that has resulted to improvement in the sewer management. However, despite the much envisaged reforms in the sewer company, consumers are still highly dissatisfied level of technology adopted by the sewer company, lack of modern sewer system equipment's and inefficiency of system to cater for huge population in Isiolo town. Based on the empirical findings, following recommendations are made:

i. The management should keep up the good spirit of embracing modern technology that will enhance sewer performance.
ii. The management of IWASCO should endeavor to maximize their staff capacity by training them and equipping them with technology skills for effective management of sewer performance.

REFERENCES

Akinola S.R, (2002) Linking Technology Choice with Operation and Maintenance for Low- Cost Water Supply and Sanitation. The Hague, the Netherlands: IRC International Water and Sanitation Centre.

Baker (1992) Evaluation for Village Water Supply Planning. New York: John Wiley & Sons.

Buller, H,(2006) Environmental Health Engineering in the Tropics: An Introductory Text, Second Edition. New York: John Wiley & Sons.

Davis,(2005) Lessons Learned in Water, Sanitation and Health: Thirteen Years of Experience in Developing Countries. Arlington, Virginia: Water and Sanitation for Health (WASH) Project.

Davis, Bagozzi and Warshaw, (2001). Just Stir Gently: The way to mix hygiene education with water supply and sanitation. The Hague, the Netherlands: IRC International Water and Sanitation Centre.

Karanja,J.& Nyambura,E.(2014) Factors influencing implementation of integrated financial management systems in government ministries. Research journal of finance and accounting,5 (7),10-17.

Kinoti .M.K (2010) Towards Sustainable Water and Sanitation, Consultant, Nairobi, Kenya.

Kombo and Tromp (2006) Proposal and Thesis writing: An introduction, Nairobi: Paulines Publication Africa

Kothari, C. (2003) Research Methodology(2nd Edition): New Delhi new age international (p) Ltd

Megginson and Netter (2001). Water and Sanitation: Economic and Sociological Perspectives. New York: Academic Press Inc.

Moses and Kalton (1997) Research Methods in Anthropology, Third Edition: Qualitative and Quantitative Methods. Walnut Creek, California: AltaMira Press.

Mugenda, .M and Mugenda,AG (2003).Research Methods. Quantative and Qualitative Approaches: Nairobi Act press.

Patoon, C (2002) Methods in behavioral research, Fulerton, Mayfield publishing company

Panda,S,M (2007) "The Value of Water Supply and Sanitation in Development: An Assessment." American Journal of Public Health, vol. 78, no. 11, pp. 1463- 1467.

Perkins (2008) Water Supply and Sanitation in Developing Countries. London: The Institution of Water Engineers and Scientists

Pickfords (2001) Developing and Managing Community Water Supplies. (Oxfam Development Guidelines No. 8). Oxford: Oxfam

Renzetti and Dupond (2004) The Worth of Water: Technical Briefs on Health, Water and Sanitation. London: IT Publications.

Straight Et Al (1993) understanding qualitative data: framework of tests analysis methods and techniques, journal of London

Tjandraatmadja and Burn (2005). Low-Cost Sanitation: A Survey of Practical Experience. London: Intermediate Technology Publications

Tyles (1991) Conducting Educational Research (5th Edition) Fort Worth, College Publishers

UNEP (2008) Community Water Supplies in Developing countries: Lessons from experience project evaluation, report NO. 7 USA, Washington, DC

UNDP (United Nations Development Programme). (2007). Human Development Report 2001. http://www.undp.org/hdr2001.

United Nations. (2006). The Millennium Development Goals Report 2006, New York

Water Act (2002) Government printers. Kenya

WHO and UNICEF (United Nations Children's Fund). (2007). UNICEF Statistics – Africa. Mali. http://www.unicef.org/statis/Country_1Page110.html.